CLAIMS:

1. A fiber optic wavelength switch comprising:

(a) a front-end unit having a plurality of optical ports, said front-end unit comprising:

(i) a fiber array comprising a plurality of fibers coupled to the plurality of optical ports for transmitting and receiving optical signals;

(ii) a micro-lens array having a plurality of micro-lenses, each micro-lens being coupled to a respective fiber; and

(iii) a lens for receiving and re-directing the optical signals from the micro-lens array;

(b) a wavelength dispersion element defining a dispersion plane;

(c) a light redirecting element associated with the wavelength dispersion element; and

(d) an actuation array operative with the light redirecting element for tilting the optical signals substantially perpendicular to the dispersion plane defined by the wavelength dispersion element.

2. The fiber optic wavelength switch of claim 1, wherein the front-end unit further includes a polarization diversity module having at least one wave plate for splitting the optical signal into two sub-signals having substantially the same polarization state.

3. The fiber optic wavelength switch of claim 1, wherein the wavelength dispersion element includes one of a diffraction grating and a prism and the light redirecting element includes a spherical reflector.

4. The fiber optic wavelength switch of claim 1, wherein the actuation array includes a micro-electro-mechanical systems (MEMS) device, the MEMS device having a plurality of reflectors movable about an axis defined by the dispersion plane.

5. The fiber optic wavelength switch of claim 4, wherein a position of each of the plurality of optical ports is related to an angular displacement of input and output beams of light to and from the MEMs device, respectively.

6. The fiber optic wavelength switch of claim 1, wherein the actuation array includes a liquid crystal deflection array having a plurality of pixels, each of the pixels having an optical phase array acting as an electro writable diffraction grating.

7. The fiber optic wavelength switch of claim 6, further comprising an addressing module for selecting an angle of deflection to provide a signal to one of the plurality of optical ports.

8. An optical device for rerouting and modifying an optical signal comprising:

(a) a front-end unit having a first port for launching a beam of light and a second port for receiving a beam of light, said front-end unit comprising:

(i) a fiber array comprising a plurality of fibers coupled to the first port for transmitting beams of light and to the second port for receiving beams of light;

(ii) a micro-lens array having a plurality of micro-lenses, each micro-lens being coupled to a respective fiber; and

(iii) a lens for receiving and re-directing the beams of light from the micro-lens array;

(b) a light redirecting element having a focal plane for receiving the beam of light launched from the first port;

(c) a wavelength dispersion element defining a dispersion plane and disposed substantially at the focal plane of the light redirecting element for spatially dispersing a reflected beam of light from the light redirecting element and for redirecting the spatially dispersed beam of light back to the light redirecting element; and

(d) an actuation array disposed at the focal plane of the light redirecting element for modifying the spatially dispersed beam of light reflected from the light redirecting element in a direction substantially perpendicular to the dispersion plane defined by the wavelength dispersion element and for reflecting the modified spatially dispersed beam back to the second port of the front-end unit through the light redirecting element and the wavelength dispersion element.

9. The optic device of claim 8, wherein the front-end unit further includes a polarization diversity module having at least one wave plate for splitting the beam of light launched from the first port into two sub-beams having substantially the same polarization state.

10. The optic device of claim 9, wherein the wavelength dispersion element includes one of a diffraction grating and a prism and the light redirecting element includes a spherical reflector.

11. The optic device of claim 9, wherein the actuation array includes a micro-electro-mechanical systems (MEMS) device, the MEMS device having a plurality of reflectors movable about an axis defined by the dispersion plane.

12. A method of rerouting and modifying an optical signal comprising:

(a) launching a beam of light towards a reflecting element having a focal plane;

(b) redirecting the beam of light incident on the reflecting element to a dispersion element defining a dispersion direction, said dispersion element disposed substantially at the focal plane;

(c) spatially dispersing the redirected beam of light into a plurality of different sub-beams of light corresponding to a plurality of different spectral channels;

(d) redirecting the plurality of different sub-beams of light to an actuation array optically disposed substantially at the focal plane;

(e) selectively modifying the plurality of different sub-beams of light in a direction substantially perpendicular to the dispersion direction and reflecting them in a substantially backwards direction; and

(f) redirecting the selectively modified plurality of different sub-beams to the dispersion element and combining them to form output beams of light.

13. The method of claim 12, wherein the step of launching includes receiving the beam of light in a micro-lens and redirecting the beam of light from the micro-lens using a lens to direct the beam of light to the reflecting element.

14. An optical device for rerouting and modifying an optical signal comprising:

(a) a first port for launching a beam of light, said first port comprising:

(i) a fiber coupled to the first port for transmitting and receiving optical signals;

(ii) a micro-lens coupled to the fiber; and

(iii) a lens for receiving and re-directing the optical signals from the micro-lens;

(b) a first light redirecting element having a focal plane for receiving the beam of light launched from the first port;

(c) a first wavelength dispersion element defining a dispersion direction and disposed substantially at the focal plane of the light redirecting element for spatially dispersing a reflected beam of light from the light redirecting element and for redirecting the spatially dispersed beam of light back to the light redirecting element;

(d) a transmissive deflector disposed substantially at the focal plane for receiving the spatially dispersed beam of light reflected from the first light redirecting element and redirecting the spatially dispersed beam of light in a direction substantially perpendicular to the dispersion direction defined by the first wavelength dispersion element;

(e) a second light redirecting element for receiving the spatially dispersed beam of light from the transmissive deflector; and

(f) a second wavelength dispersion element for recombining the spatially dispersed beam of light from the second light redirecting element and for directing the recombined beam of light to the second light redirecting element.

15. The optical device of claim 14, wherein the first port further includes a polarization diversity module having at least one wave plate for splitting the beam of light launched from the first port into two sub-beams having substantially the same polarization state.

16. The optical device of claim 15, wherein the first and second wavelength dispersion elements include a diffraction grating and the first and second light redirecting elements include a spherical reflector.

17. A fiber optic wavelength switch comprising:

(a) a front-end unit having a plurality of optical ports coupled to a plurality of lenses for transmitting and receiving beams of light;

(b) a wavelength dispersion element defining a dispersion direction;

(c) a light redirecting element associated with the wavelength dispersion element; and

(d) an actuation array operative with the light redirecting element for tilting the beams of light substantially perpendicular to the dispersion direction defined by the wavelength dispersion element.

18. The fiber optic wavelength switch of claim 17, wherein the front-end unit further includes a polarization diversity module having at least one wave plate for splitting one of the transmitted beams of light into two sub-signals having substantially the same polarization state.

19. The fiber optic wavelength switch of claim 17, wherein the wavelength dispersion element includes one of a diffraction grating and a prism and the light redirecting element includes a spherical reflector.

20. The fiber optic wavelength switch of claim 19, wherein the actuation array includes a micro-electro-mechanical systems (MEMS) device, wherein the MEMS device includes a plurality of reflectors movable about an axis defined by the dispersion direction.